



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/708,535	03/10/2004	Ronald L. Gordon	FIS920040008	2534
23550	7590	02/21/2006	EXAMINER	
HOFFMAN WARNICK & D'ALESSANDRO, LLC 75 STATE STREET 14TH FL ALBANY, NY 12207				YOUNG, CHRISTOPHER G
ART UNIT		PAPER NUMBER		
		1756		

DATE MAILED: 02/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/708,535	GORDON ET AL.
	Examiner	Art Unit
	Christopher G. Young	1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 29 December 2005.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-19 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ . |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ . | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| | 6) <input type="checkbox"/> Other: _____ . |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. Claims 1-19 are rejected under 35 U.S.C. 102(b) as being anticipated by LaCour, Patent Application Publication US 2002/0155357.

The instant application is drawn to a method for increasing coverage of subresolution assist features (SRAFs) in a layout. A set of possible SRAF placement and sizing rules for a given pitch is provided, ranked according to some figure of merit. During SRAF placement, the fit of a plurality of different SRAF solutions is successively evaluated to find the SRAF solution, or combinations thereof, which most improves lithographic performance while avoiding manufacturability problems. In general, the method comprises: obtaining a plurality of SRAF configurations for the layout; ranking the SRAF configurations based on a figure of merit; applying a highest ranked SRAF configuration to the layout; applying a predetermined number of lower ranked SRAF configurations to the layout; and selecting SRAF features from at least one of the applied SRAF configurations to provide the optimal SRAF configuration for the layout.

The prior art reference clearly describes, teaches and suggests the instant invention as claimed. Careful review of paragraphs 38-42 describes the claimed invention. Here, FIG. 5 shows the steps of a preferred embodiment of the present

invention. In step 502, a mask design is analyzed to determine where assist features or other resolution enhancement techniques can be employed, and the preferred form of those techniques. Although the description below refers to assist features and scattering bars, the invention is useful with any resolution enhancement technique that entails mask alteration that may conflict. The invention is not dependent on the method used to analyze the mask and generate the assist features. The assist features can be determined and inserted into the design at any level of the design process, although it is typical to determine assist features as part of the verification process or as part of the data preparation procedure for mask writing. If the assist features are added after the design is flattened, that is, reduced to a single level, the determination of assist features is less complex, but many more computations are required. If the assist features are added when the design is still at a level of repeating cells, the assist features can be determined once for the interior of the cell, and those assist features will be the same for all cell interiors. It is still necessary to examine the interactions between edges at the cell boundary, however, to determine whether assist features are necessary near cell boundaries.

In step 504, assist features are assigned priority values. The priority values can be assigned based solely on the geometry of the mask, without regard to function of the circuit features represented by the mask elements. For example, if a mask element edge generates multiple assist features, those features closer to the mask element may be assigned a higher priority than features further from the element. Features generated from an edge parallel to an axis of the mask may be assigned a higher

priority than assist features generated by an edge that is not parallel to an axis. In some embodiments, priority can be based upon the function of a feature in a circuit, for example, a feature on the mask that corresponds to a transistor gate may be assigned a higher priority than a feature that corresponds to an interconnect between transistors.

In step 506, interfering assist features are identified. Assist features are considered to interfere when the combination of assist features, or the combination of assist features with altered mask features interact to adversely affect the fidelity of the printing. For example, when features touch or are closer than a minimum spacing, they can cause an artifact to be printed on the photoresist. Assist features can also interfere by producing a combination that will interfere with mask production or inspection, such as small extensions past a line that will appear as an error to a mask inspection system.

In step 508, the interfering assist feature having the lowest priority is altered to eliminate the interference. The alteration may entail changing, reducing, or removing the assist feature. In step 510, the mask design is reviewed a final time to clean up any aspects of the modified design that will cause a problem in manufacturing the mask, inspecting the mask, or printing. The process is then complete. Skilled persons will recognize that many of the steps in FIG. 5 can be combined or performed in a different order. For example, priority values can be assigned after interfering assist features are identified, and only interfering assist features need to be assigned priority values.

Response to Arguments

3. Applicant's arguments filed December 29, 2005 have been fully considered but they are not persuasive. The Examiner relies on the rejection already of record as set forth above. Additionally, the Examiner points out that Figure 6, discussed at paragraphs 43 through 58, establish the teachings of anticipation of the prior art. In the discussion of this Figure it is shown that the assist features are grouped and prioritized before implementation. The argument that the claimed "figure of merit" is patentably defined over the prior art is not persuasive. A reasonably broad interpretation of the claim language would clearly include the teachings of the prior art as set forth in the rejection. Furthermore, the arguments pertaining to claim 17, and its dependent claims, are not persuasive. The method of Figure 6 determines distances between edges of features. This is interpreted as dividing the layout into spaces. The assist features are then implemented taking account of other adjacent assist features. This is shown in step 614.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

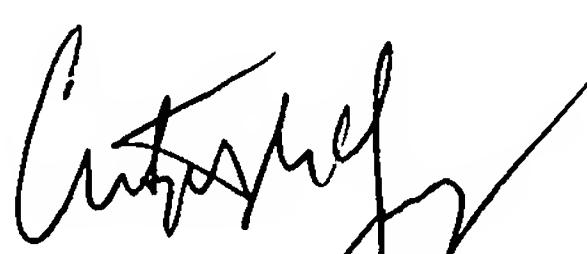
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher G. Young whose telephone number is 571-272-1394. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Christopher G. Young
Primary Examiner
Art Unit 1756

cgy